MEM-4 64K STATIC MEMORY

The MEM-4 is a 64K static RAM/ROM board using 2016 RAMs or 2716 EPROMs. RAMs and EPROMs may be intermixed through out the board with only a jumper for each socket changed for installation.

Memory may be expanded in 2K increments and may be random through out the board.

Bi-directional busing is provided on DI on DO links, so with 2 boards 16 bit buss can be made.

Extended address is also provided (IEEE696).

All suport chips are interchangable with 74CXX, so with CMOS RAM and ROM equivalents of the 2016 and 2716 (Toshiba 5516 and National 27C16 for example) the whole memory will consume minimal power.

Additional option of Phantom is available.

Bank addressing is available in conjunction with the extended addressing and extended addressing port on the IOB-6 (or SSM CB2, etc.). Bank select is in the options of the whole board, or the upper 16K (for boot).

Power consumption is around 1.25 amp. with non-CMOS parts.

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WAMECO, Inc. MEM-4 64K RAM/ROM board parts list

QUANTITY	Schematic name	description
1		74LS13/74LS20/74LS40 or 74C20
1		74LS14/74LS04/74HC04
1		74LS30/74HC30
1		74LS85/74HC85
2		74LS138/74HC138
1		74LS173/74HC173
4		74LS243/74HC243
2		74LS244/74HC244
1		74LS688/74HC688
32	RAM	TMM2016/TMS4016
	CMOS RAM	MCM65116/HM6116
	ROM	2716/TI2516
	CMOS ROM	27C16
2		2.7K-4.7K SIP pack
	for CMOS use	20K-50K SIP pack
3		340T-5/7805*
4		.05-.1uf disk ceramic
4		4.7-22uf 10V min. Tant.
		.01-.1 disc ceramic
3		sets screws and nuts
3		#361 heatsinks
7		14 pin sockets
4		16 pin sockets
3		20 pin sockets
32		24 pin sockets
14		3 x 1 pin connectors
11		3 x 2 "
3		8 x 1 "
		all connectors have .1 x .1 center

* In a CMOS system minimum power is consumed. While in operation, only 1 7805 is required. The other two may be deleted and their outputs jumpered to the single 7805.

Assembly

Assembly should start with the sockets. To ensure the sockets are flush with the board, it is recommended that a row at a time are soldered. Insert a row of sockets and tape (using masking tape) them down. Turn the board over and solder alternate corner pins on each socket. Once the whole row is done, remove the tape and using a finger, press on the socket while reheating both soldered corners. By doing this, the socket will be flush with the board. Once this is done for all sockets, proceed to the next row. (SIP resistors should be soldered the same way.)

Resistors should be inserted next. Use a lead forming tool for best results. Insert resistors into holes and bend them over on the back of the board so they will remain flush with the board while soldering. Note position and value for each resistor on the parts list and parts layout.

Capacitors. Insert all disc ceramics. Use parts list and parts layout for values. They should also have the leads bent over prior to soldering to ensure flush mounting. Install electrolytic capacitors similarly, noting the polarity on the silkscreen.

Jumpers and plugs. Cut the jumpers or plugs to the proper length. Insert in the proper location and solder similarly to the soldering proceedure of the sockets, by taping them down, soldering corners, removing tape and pressing down with a finger while reflowing the soldered corners. (Note: Do not touch the pin that is being reflowed.) Solder all the remaining pins once the jumper or plug is flush with the board.

Regulators. Mount the 7805/340T-5 with appropriate heatsinks. Use 4-40 screws, with the nut on the top of the board. Before tightening down the screws, center the heatsink on the regualtors. Tighten screws and solder regulator into place.

All leads should be trimmed at this time. Inspect the board for solder shorts. This completes a brief proceedure on assembling the MEM-4. Once everything is soldered, do an ohm check from +5 to ground and from +8 to ground, to ensure there are no shorts. It is recommended at this time to plug the board in to make sure the regulator is working. The output voltage should be 5.25 to 4.75 volts. At this time remove the board (making sure power is off) and insert all IC's. Make sure no pins get bent under. Once all IC's are in place, put the board back in the computer and apply power. Recheck the voltage. If the voltage is low, then there is a problem on the board (a shorted trace or bad IC) or the regulator. If it is high the regulator is bad. Fix the problem before proceeding to the next section.

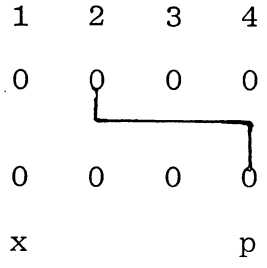
Installation

The MEM-4 occupies 65K of memory which is a full compliment for most systems. To use, install memory chips in desired location(s). The addresses are marked on the silk screen. Secondly, each location must be configured for ROM or RAM. Each memory socket has a jumper associated with it. Sockets are numbered U1 through U32. The corresponding jumpers are labeled 00 through F8. Each socket that has a memory device must be jumpered. Jumper center pin (marked "C" in further paragraphs) of jumper block to W for RAM and to D for ROM.

To select Bank desirable on the upper 16K block using the IEEE 696 extended address, jumper BNK A to B. Otherwise jumper B to C. Then jumper on ADD the number of the bank, that this bank is valid (see bank/extended addressing ADD for definition).

To select Wait States for board. 0,1,2,3 or 4 wait states are available on WAIT. Jumper desired number of wait states for either the XRDY or PRDY lines. No jumpers correspond to no wait states.

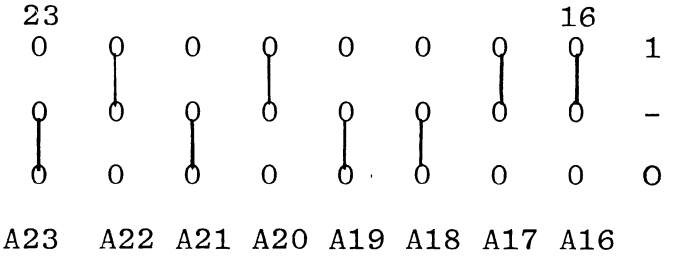
example:



2 wait states to PRDY

Bank/extended addressing. This board has the feature of extended addressing, which may be used as bank address with additional circuitry. (See engineering note # 2 for bank circuit.) Basically, the 74LS688 compares the eight bit from ADD to that on A16 to A23. When they are the same, it enables the board. In bank addressing all bits must be low except for the one bit that enables the bank or in extended address, the comparison is a normal address.

example: For board to be enabled from 53000 to 53FFF



In addition, EXAD must be jumpered to allow the decoding to disable the board. Jumper C to E if the board is to be driven from extended address comparator. Jumper EXAD C to D if the extended address comparator is to be disabled.

Phantom disable. The MEM-4 may be disabled by Phantom disable. Jumper PHAN C to E if it is to be disabled by Phantom or jumper C to D if Phantom disable is not used.

Bi directional bussing. The MEM-4 may be used with bi-directional bussing on either the DI or DO lines. This will allow 16 bit transfers when 2 MEM-4's are used, one on DI and one on DO. This also allows the MEM-4 to be easily used in other busses where Bidirectional bussing is used.

For normal use jumper: DI C to S DO C to S

for bidirectional on DI lines: DI C to B and remove U6&U13

for bidirectional on DO lines: DO C to B and remove U7&U14

Board disable for unloaded memory, the 74LS30 decodes an FF on the MEM-4's data buss which in turn disables the output devices. This will enable users to overlap ROMs with different memory boards. Only the used portion of ROMs are actually allowed in the memory map (so long as the unused portion of the ROMs are loaded with FF).

In addition, this will also interpret any unloaded RAM as an FF and disable output buffers. Unfortunately it will also interpret any data that is FF as unloaded and will disable the output drivers. Therefore the CPU must be able to discriminate a floating buss as an FF. This requires at least pull up on the Data lines to the CPU. If the board is fully populated, it is recommended that the 74LS30 be removed and pin 8 be tied to +5 volts.

ENGINEERING NOTE #1

It may be desirable to provide wait states for a couple of on board ROMs only. This may be accomplished by cutting the trace that goes to pin 1 of the 74LS173 to the chip select, pin 20, of the desired memory that requires a wait state. This will provide the wait states for the two memory ICs (4K) driven from that CE line only. No other wait states are possible.

Wait states are also possible on a single memory chip by cutting the trace between pins 1 and 2 on the 74LS173 and between pin 1 on the 74LS173 and the 74LS14. Then connect pin 1 of the 74LS173 to the CE (pin 20) on the desired memory device and pin 2 of the 74LS173 to the OE (pin 18) of the desired device. This is more difficult since the connection between pin 1 and 2 of the 74LS173 is on the top of the board beneath the socket.

ENGINEERING NOTE #2

The following circuit may be used to generate Bank addressing from the extended addressing. Basically it latches the data sent to the port defined as bank addressing port and sends it out on the extended address lines. Normally the port is defined as 40 H. On the RAM board, the extended address comparators are set to the value that would enable the RAM board.

If board is to be enabled for D0, the extended address comparator would be set to 01. Table 1 sets values to compare to.

Data Bit	Comparison
D0	01
D1	02
D2	04
D3	08
D4	10
D5	20
D6	40
D7	80

A similar circuit is incorporated on the IOB-6 2S+3P. Some other manufacturer's processor boards also incorporate a similar scheme.

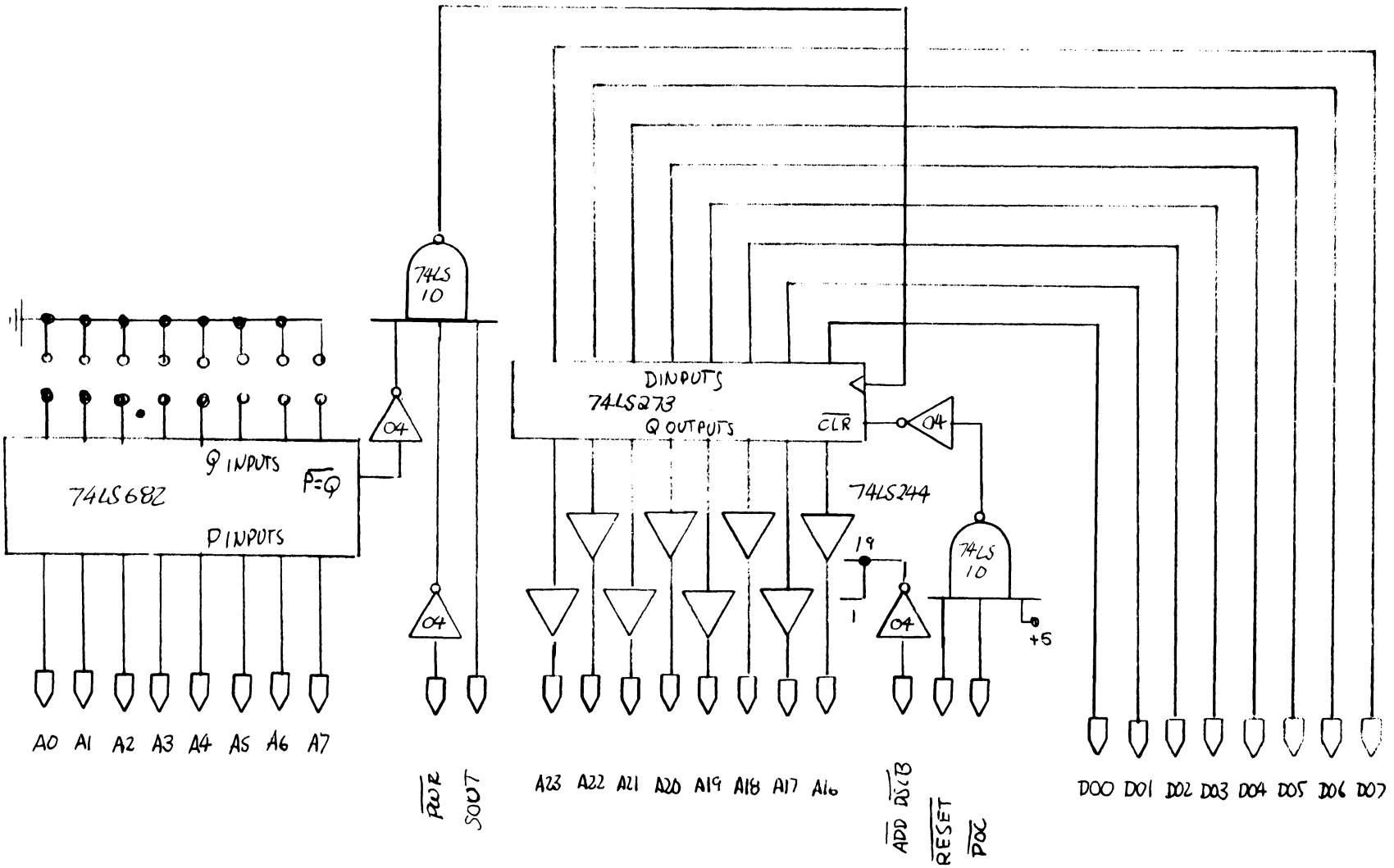


figure 1: Typical circuit for using extended addressing for bank selection.

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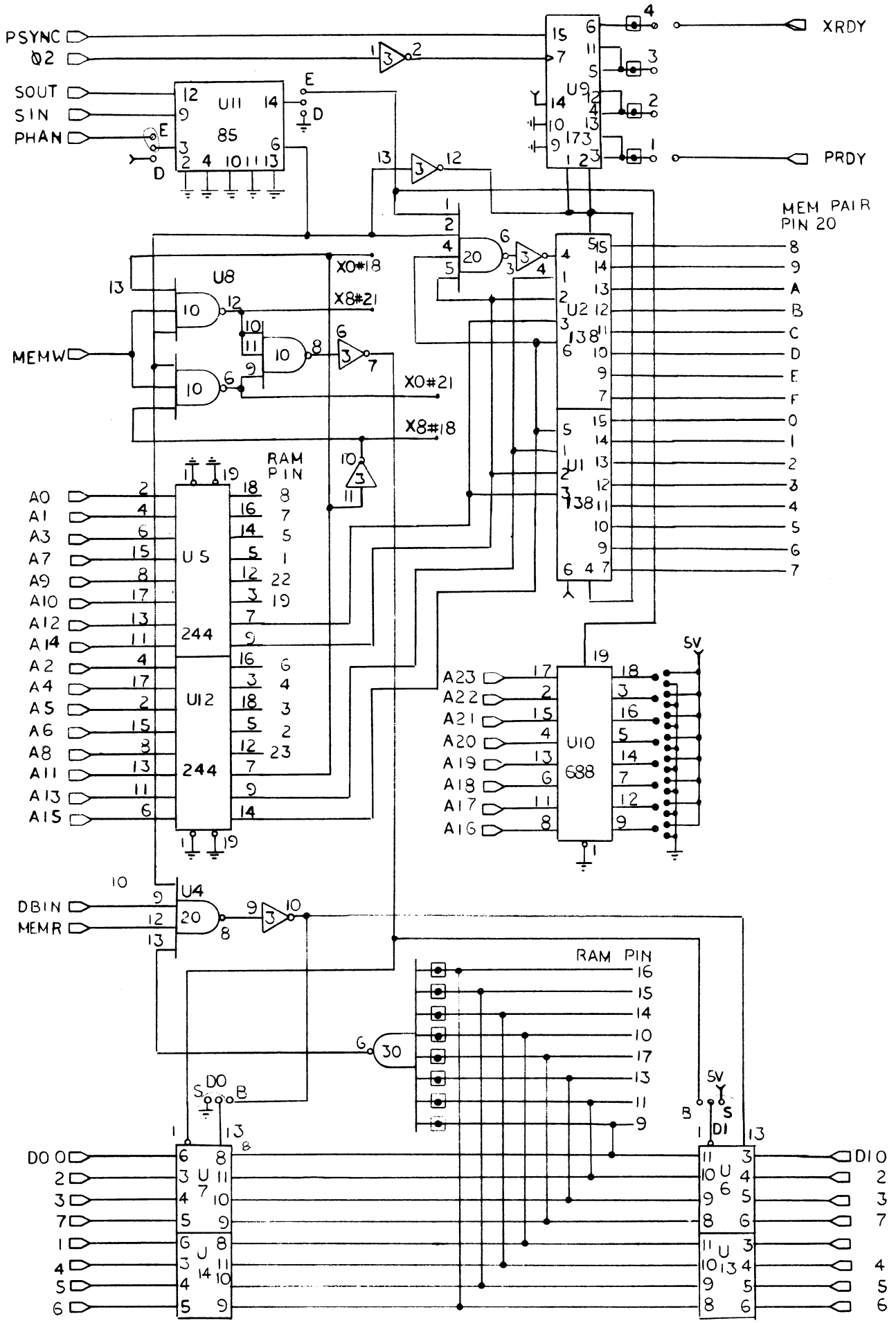

MEM-4

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Correction to Documentation on Bank Disable

Jumper center pin of BNK to E for bank disable on upper 16K of memory.

Jumper pin E of BNK to D for no bank disable on upper 16K of memory.